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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 504

Application Number: 09/274,014

Filing Date: March 22, 1999

Appellant(s): VOUTE ET AL.

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Stephen A. Bent  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 12 March 2004.

**(1) Real Party in Interest**

A statement identifying the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) Status of Claims**

The statement of the status of the claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed. Though the after final communication filed 06 June 2003 is titled "AMENDMENT AND REQUEST FOR RECONSIDERATION", no amendment is contained therein. Though the after final communication filed 01 April 2003 is titled "AMENDMENT AND REQUEST FOR RECONSIDERATION" and purports to include a proposed amendment to claims 1 and 6, and includes text corresponding to claims 1 and 6, the claims in fact are not amended, but identical to the finally rejected claims.

**(5) Summary of Invention**

The summary of invention contained in the brief is substantially correct. The examiner only wishes to point out that on page 9, line 27 (and in several other portions) of the specification, it is stated that percent pore volume being less than "about 30%" is an aspect of the invention (emphasis added).

**(6) Issues**

The appellant's statement of the issues in the brief is correct.

**(7) Grouping of Claims**

Appellant's brief includes a statement the claims do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8). Appellant separately argues three subsets of claims by providing additional reasons for patentability, these subsets are designated Group 2: claims 11 and 12; Group 3: claims 7,8 and 60; and Group 4: claims 2, 3, 6 and 59-63.

**(8) ClaimsAppealed**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) Prior Art of Record**

5,445,732	Girot et al.	8-1995
4,203,772	Davis, Jr. et al.	05-1980

**(10) Grounds of Rejection**

The following grounds of rejection are applicable to the appealed claims:

Claims 1-22 and 59-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Girot et al. (US 5,445,732), and in the alternative over Girot et al. (US 5,445,732) in view of Davis, Jr. et al. (US 4,203,772). Regarding **claim 1**, Girot ('732) discloses dense mineral oxide supports comprising a mineral oxide matrix (see col. 5, lines 40-62) having an external surface and pores (see col. 5, lines 3-5); and an interactive polymer network which fills the pores and is coated on the surface of the mineral oxide matrix

(see col. 5, lines 3-15 and 40-62; col. 15, lines 38 and 39, col. 17, lines 31-34), so that subsequent interaction with macromolecules occurs on the external surface of the support (see col. 5, lines 25-39 and col. 6, lines 31-35). Girot ('732) does not explicitly disclose the porosity being "less than 30% of the total volume of the mineral oxide matrix" as claimed. However, Girot ('732) recognizes that a broad range of porosities are suitable for the invention (see "about 0.2 to about 2 cm<sup>3</sup>/gram"; col. 8, lines 40-45; col. 15, lines 45-55; col. 36, lines 12-15). As held in *In re Aller*, 220 105 USPQ 233, 235 (CCPA 1955), "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." Therefore, it is considered that the claimed support is unpatentable as it differs from support of Girot ('732) only in that an optimal or workable range of the porosity has been discovered. Although the court referred not only to the "optimum" range, but also the "workable" range, one of ordinary skill in the art would be motivated to have minimized the porosity because Girot ('732) states that "it is generally desirable to have as great a density difference as possible between the solid support particles and the fluidizing medium" (col. 2, lines 8-11), and "fluidization of dense particles in aqueous suspension is possible at high flow rates that, in turn, are very desirable when dealing with large scale applications" (col. 2, lines 17-19). Of course, as would be understood by one of ordinary skill in the art, minimizing porosity (percent empty space) maximizes density. In the alternative, the claim is considered unpatentable over Girot ('732) in view of Davis ('772). Davis ('772) explicitly discloses mineral oxide matrixes having porosities less than 30% (see Tables II and III). It is considered that it would have been obvious to one

of ordinary skill in the art to have employed the matrix material of Davis ('772) for the matrix of Girot ('732) because Girot ('732) emphasizes that “[a] wide variety of non-passivated porous solids matrices are amenable to passivation by the general method of the present invention” (col. 5, lines 40-42”). Furthermore, Girot ('732) goes on to specifically suggest “mineral oxide” matrices including oxides of “zirconium” (see col. 5, lines 42-62), providing strong motivation look toward the teachings of Davis ('772), which concern zirconium oxide matrices. Regarding **claims 2, 3 and 59**, it is considered that the density would intrinsically be in the claimed ranges of 1.7-11 and 2.1-10 if the porosity is less than <30%, because zirconium oxide (which both references disclose) has a density of 5.6 (see CRC Handbook of Chemistry and Physic, 59<sup>th</sup> edition, page B-184). Regarding **claims 4 and 5**, Girot ('732) discloses particle sizes within the claimed ranges of 5-500 microns and 10-100 microns (see col. 8, lines 47-53). Regarding **claim 6**, Girot ('732) discloses a dense mineral oxide supports comprising a mineral oxide matrix having an external surface and pores; and an interactive polymer network which fills the pores and is coated on the surface of the mineral oxide matrix (see col. 5, lines 3-15 and 40-62; col. 15, lines 38 and 39), so that subsequent interaction with macromolecules occurs on the external surface of the support (see col. 5, lines 25-39 and col. 6, lines 31-35). Girot ('732) further discloses a particle size within the range 10-100 microns (see col. 8, lines 47-53). Girot ('732) does not explicitly disclose the porosity being “less than 30% of the total volume of the mineral oxide matrix” as claimed. However, Girot ('732) recognizes that a broad range of porosities are suitable for the invention (see col. 8, lines 40-45; col. 15, lines 45-55;

col. 36, lines 12-15). As held in *In re Aller*, 220 F.2d 105 USPQ 233, 235 (CCPA 1955), “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” Therefore, it is considered that the claimed support is unpatentable as it differs from support of Girot ('732) only in that an optimal or workable range of the porosity has been discovered. Although the court referred not only to the “optimum” range, but also the “workable” range, one of ordinary skill in the art would be motivated to have minimized the porosity because Girot ('732) states that “it is generally desirable to have as great a density difference as possible between the solid support particles and the fluidizing medium” (col. 2, lines 8-11), and “fluidization of dense particles in aqueous suspension is possible at high flow rates that, in turn, are very desirable when dealing with large scale applications” (col. 2, lines 17-19). Of course, as would be understood by one of ordinary skill in the art, minimizing porosity (percent empty space) maximizes density. In the alternative, the claim is considered unpatentable over Girot ('732) in view of Davis ('772). Davis ('772) explicitly discloses mineral oxide matrixes having porosities less than 30% (see Tables II and III). It is considered that it would have been obvious to one of ordinary skill in the art to have employed the matrix material of Davis ('772) for the matrix of Girot ('732) because Girot ('732) emphasizes that “[a] wide variety of non-passivated porous solids matrices are amenable to passivation by the general method of the present invention” (col. 5, lines 40-42”). Furthermore, Girot ('732) goes on to specifically suggest “mineral oxide” matrices including oxides of “zirconium” (see col. 5, lines 42-62), providing strong motivation look toward the teachings of Davis ('772),

which concern zirconium oxide matrices. It is considered that the density would intrinsically be in the claimed ranges of 1.7-11 and 2.1-10 if the porosity is less than <30%, because zirconium oxide (which both references disclose) has a density of 5.6 (see CRC Handbook of Chemistry and Physic, 59<sup>th</sup> edition, page B-184). Also, the discussion of Girot ('732) of the advantages of high density were discussed above. Regarding **claims 7, 8 and 60**, it is considered not inventive to have discovered optimum or workable ranges of porosity as discussed above. Davis ('772) discloses specific porosity values (7.9%, 18.8% etc.) which are within each claimed range (see Tables II and III). Regarding **claim 9 and 61**, zirconia is disclosed by both references (see Girot '732, col. 5, lines 58-62 and Davis '772, title). Regarding claims **10 and 62**, the interactive polymer network comprises a soluble organic polymer crosslinked in place (see col. 15, lines 17-20). Regarding **claims 11 and 12**, polysaccharides, including dextran, are disclosed by Girot ('732) (see col. 16, line 59). Regarding **claims 13 and 15-22**, the monomer may be vinylpyrrolidone (see col. 18, line 27), thereby satisfying the each of claims 13 and 15-22. Regarding **claims 14 and 63**, the polymer network comprises monomers copolymerized in place with the mineral oxide matrix (col. 15, lines 17-20).

**(11) Response to Argument**

Initially, it must be pointed out that the brief includes a material scientific/mathematical error in its analysis of Girot ('732). Appellant appears to make the error against appellant's own interest, as the correct calculations are more favorable to appellant's argument. The error originates in the mathematics, assumptions and

reasoning of the first full paragraph of page 12, but is relied upon throughout the arguments of the brief. Putting aside for the moment the issue that appellant has selected the narrowest porosity range of Girot ('732), 0.8 to 1.2 cm<sup>3</sup>/gram, ignoring the broader range of 0.2 to 2.0 cm<sup>3</sup>/gram, the flawed analysis of page 12 must first be addressed. Appellant claims percent pore volume (porosity), while, in the above quoted ranges, Girot ('732) discloses porosity in units of volume/mass, particularly cm<sup>3</sup>/gram. Porosity in cm<sup>3</sup>/gram units cannot be converted to percent pore volume without knowing the intrinsic density (density with no pores) of the material in question. Appellant takes the example of the material being silica (silicon dioxide), but incorrectly calculates percent porosity from the range 0.8 to 1.2 cm<sup>3</sup>/gram. The term "silica" does not correspond precisely to an intrinsic density because various atomic arrangements exist with somewhat different densities. The intrinsic density of silica therefore ranges from about 2.1 to about 2.6 grams/cm<sup>3</sup> (see CRC Handbook of Chemistry and Physic, 59<sup>th</sup> edition, page B-161). Appellant's statement "porous silica has a volume/weight ratio of 2, i.e., 2 ml or 2 cm<sup>3</sup> of beads yield about 1 gram of material" is completely irrelevant to the conversion (of 0.8 to 1.2 cm<sup>3</sup>/gram to a percent porosity range). This is because the statement assumes a particular porosity. The statement that porous silica has a particular volume/weight ratio completely contracts the concept of a range of porosities. The relevant physical constant needed to make the conversion appellant desires is the intrinsic density of silica. Let us take the example of silica having an intrinsic density of 2.19 grams/cm<sup>3</sup> (the density of amorphous silica). This corresponds to a volume/weight

ratio of  $0.457 \text{ cm}^3/\text{gram}$ , in stark contrast to the value of  $2 \text{ cm}^3/\text{gram}$  mentioned by appellant. Now, let us attempt to convert the range  $0.8$  to  $1.2 \text{ cm}^3/\text{gram}$  properly:

Conversion of  $0.8 \text{ cm}^3/\text{gram}$ :

One gram has  $0.8 \text{ cm}^3$  of voids. One gram has  $0.457 \text{ cm}^3$  of solid. The total volume of one gram is  $0.8 + 0.457 = 1.257 \text{ cm}^3$ . The porosity is  $0.8/1.257$  or  $64\%$ .

Conversion of  $1.2 \text{ cm}^3/\text{gram}$ :

One gram has  $1.2 \text{ cm}^3$  of voids. One gram has  $0.457 \text{ cm}^3$  of solid. The total volume of one gram is  $1.2 + 0.457 = 1.657 \text{ cm}^3$ . The porosity is  $1.2/1.657$  or  $72\%$ .

In summary, appellant has miscalculated that porous volume of  $0.8$  to  $1.2 \text{ cm}^3/\text{gram}$  corresponds to  $40\%$  to  $60\%$  porosity for silica. Actually it corresponds to about  $64\%$  to  $72\%$ .

Based upon the above, the examiner agrees that the narrow range  $0.8$  to  $1.2 \text{ cm}^3/\text{gram}$  does not correspond to less than  $30\%$  porosity. However, Girot ('732) discloses a broader range "about  $0.2$  to about  $2 \text{ cm}^3/\text{gram}$ " (see col. 8, line 44; col. 15, line 51; col. 36, line 14) and states that silica in this range is "most preferred" (col. 15, line 48). Thusly, appellant has ignored what Girot ('732) has characterized as most preferred. Furthermore, Girot ('732) is not limited to this "most preferred" range of  $0.2$  to  $2 \text{ cm}^3/\text{gram}$ . As done above for other values, let us convert the value  $0.2 \text{ cm}^3/\text{gram}$  to a percent porosity:

Conversion of 0.2 cm<sup>3</sup>/g:

One gram has 0.2 cm<sup>3</sup> of voids. One gram has 0.457 cm<sup>3</sup> of solid. The total volume is 0.2 + 0.457 cm<sup>3</sup> = 0.657 cm<sup>3</sup>. The porosity is 0.2/0.657 or 30%.

As seen above, about 0.2 cm<sup>3</sup>/g silica corresponds to about 30% porosity.

Compare this instant situation to *In re Woodruff* 16 USPQ2d (Fed. Cir. 1990) where the court held that where the prior art taught about 1-5% carbon monoxide concentration, and the claim was limited to "more than 5%", the claimed invention was obvious over the prior art.

Appellant argues on page 14 of the brief that:

Such an extension, beyond the range disclosed in Girot ('732), would directly contravene the ability to have biomolecules diffuse into the pores. A porosity of less than 30% as presently claimed is therefore not a "workable" range when considered in light of the purpose of Girot ('732).

This argument is unconvincing for at least the two following reasons:

- a. Most claims of Girot ('732) are not limited to a particular porosity.
- b. A percent porosity of less than 30% would not prevent biomolecules from entering the pores. The size of individual pores determines whether or not biomolecules may enter, not the percent porosity. There may be many extremely small pores yielding a high percent porosity while preventing entry of biomolecules, or there may be few large pores yielding a low percent porosity while allowing entry of

biomolecules. Far from being a just a hypothetical possibility as applicant alleges, in the manner in which porous metal oxide beads are made in the art by high temperature firing, decreasing percent porosity actually *increases* the size of the individual pores (see col. 13 lines 25-42 of Carr et al. US 5,015,373, which was discussed in paper No. 22). This is possible because the number of pores simultaneously decreases.

In the sentence bridging pages 14 and 15 of the brief appellant quotes a portion of Girot ('732) which refers to "gel porosity"; however, it is critical to keep in mind "gel porosity" is the porosity of the gel which fills pores of the mineral oxide matrix, not the porosity of the mineral oxide support itself.

Appellant alleges on pages 15-16 of the brief that the matrix of Davis ('772) would not be suitable for the invention of Girot ('732); however appellant offers no evidence or reasoning to support this.

### **Unpatentability of claims 11 and 12**

On page 16 of the brief appellant states "...claim 12 more particularly recites ... dextran... These polymers are quite different than those in Girot ('732)". However, Girot ('732) explicitly recites "polysaccharides such as dextran" in col. 16, line 59.

### **Unpatentability of claims 7, 8, and 60**

These claims include narrower percent porosity ranges. However, the invention of Girot ('732) is not limited to a particular porosity range and Girot ('732) provides motivation for one of ordinary skill in the art to minimize porosity, as explained above. Furthermore, Davis ('772) discloses specific examples of metal oxide matrixes having porosities in each of the claimed ranges.

**Unpatentability of claims 2, 3, 6, 60-63**

Zirconium oxide (disclosed in col. 15, lines 47-48 of Girot '732 and disclosed in the title of and throughout Davis '772) has an intrinsic density (density a zero porosity) of 5.6 (see CRC Handbook of Chemistry and Physic, 59<sup>th</sup> edition, page B-184). The density ranges of these claims are therefore necessarily satisfied (in the instance of the oxide being zirconium oxide) if the other limitations of the claims (being less than 30% porosity), are satisfied.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Examiner  
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David Sorkin

May 14, 2004

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